

Claims

We claim:

1. A method for assembling an optical device, the method comprising:
forming a first assembly including a first lens assembly and an optical filter, the optical filter reflecting light beams at wavelengths other than a selected wavelength and transmitting a light beam at the selected wavelength, wherein the first assembly possesses a mechanical axis;
forming a second assembly including a second lens assembly;
positioning initially the first assembly and the second assembly coaxially with the optical filter facing the second assembly; and
adjusting the second assembly with respect to the mechanical axis of the first assembly such that any light beam refracting from the first assembly is collected with a minimum loss by the second assembly.
2. The method of claim 1 further comprising encapsulating the first assembly and the second assembly in a sleeve.
3. The method of claim 2, wherein the sleeve is not straight because of the second assembly positioned off the mechanical axis of the first assembly.
4. The method of claim 3, wherein the sleeve is again encapsulated in a straight sleeve.
5. The method of claim 1, wherein the forming of the first assembly comprises:
inserting the optical filter near an end of a tubing; and

placing the first lens in the tubing afterwards but a distance away from the optical filter, where the distance is adjusted with respect to a reflection measurement of a light beam at a wavelength other than the selected wavelength such that the reflection measurement is minimum.

6. The method of claim 5, wherein both of the optical filter and the first lens are respectively bonded to the tubing.
7. The method of claim 5, wherein the optical filter and the first lens are respectively bonded to the tubing by a type of adhesive.
8. The method of claim 1, wherein the forming of the second assembly comprises inserting the second lens into a tubing and bonding the second lens to the tubing by a type of adhesive.
9. The method of claim 1, wherein the adjusting of the second assembly with respect to the mechanical axis of the first assembly comprises:
 - providing the light beam at the selected wavelength through the first assembly;
 - measuring a transmission of the light beam from the second assembly;
 - adjusting the second assembly off the mechanical axis of the first assembly such that the transmission of the light beam from the second assembly becomes minimum.
10. The method of claim 9, wherein both of the first and second lenses are C-lenses.

11. The method of claim 9, wherein both of the first and second lenses are ball-lenses.

12. An optical apparatus comprising:

a first assembly including a lens and an optical filter configured at a selected wavelength and reflecting light beams at wavelengths other than the selected wavelength and transmitting a light beam at the selected wavelength, wherein the first assembly possesses a mechanical axis;

a second assembly including a second lens; and

a sleeve to encapsulate the first and second assemblies that are so adjusted in such way that the second assembly is off the mechanical axis of the first assembly, as a result, any light beam refracting from the first assembly collected with a minimum loss by the second assembly.

13. The optical apparatus of claim 12, wherein the tubing is not straight because of the second assembly positioned off the mechanical axis of the first assembly.

14. The optical apparatus of claim 12, wherein the tubing is again encapsulated in a straight sleeve.

15. The optical apparatus of claim 12, wherein the optical filter is fixed near an end of a tubing, and the lens is also fixed in the tubing a distance away from the optical filter, where the distance is obtained with respect to a reflection

measurement of a light beam at a wavelength other than the selected wavelength such that the reflection measurement is minimum.

16. The optical apparatus of claim 15, wherein both of the optical filter and the first lens are respectively bonded to the tubing.
17. The optical apparatus of claim 15, wherein the optical filter and the first lens are respectively bonded to the tubing by a type of adhesive.
18. The optical apparatus of claim 12, wherein the lens in the second assembly is fixed to a tubing by a type of adhesive.
19. The optical apparatus of claim 12, wherein the first and second assemblies are positioned in the sleeve by:
 - providing the light beam at the selected wavelength through the first assembly;
 - measuring a transmission of the light beam from the second assembly;
 - adjusting the second assembly off the mechanical axis of the first assembly such that the transmission of the light beam from the second assembly becomes minimum.
20. The optical apparatus of claim 19, wherein both of the first and second lenses are C-lenses.
21. The optical apparatus of claim 19, wherein both of the first and second lenses are ball-lenses.

22. An optical apparatus comprising:

 a first lens and a second lens;

 an optical filter configured at a selected wavelength and reflecting light beams at wavelengths other than the selected wavelength and transmitting a light beam at the selected wavelength, the optical filter being in nearly contact between the first and second lenses;

 at least one optical pigtail providing a light beam positioned a distance from the first lens, wherein the distance is adjusted with respect to a reflection measurement of a light beam at a wavelength other than a selected wavelength of the such that the reflection measurement is minimum.

23. The optical apparatus of claim 22, wherein the first lens and the second

 lenses are identical type.

24. The optical apparatus of claim 23, wherein the first lens and the second

 lenses are selected from a group consisting of C-lenses, ball-lenses and
 GRIN-lenses.